



ICAO ENGINE nvPM EMISSIONS DATA SHEET

SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-7B27E/B3 BYPASS RATIO (-): 5.1
 UNIQUE ID NUMBER: 01P11CM123 PRESSURE RATIO π_{co} (-): 29.0
 COMBUSTOR: Tech Insertion
 ENGINE TYPE: TF RATED OUTPUT F_{co} (kN): 121.4

REGULATORY DATA

CHARACTERISTIC VALUES:	LTO_{mass}/F_{co} (mg/kN)	LTO_{num}/F_{co} (particles/kN)	NVPM MASS CONCENTRATION ($\mu\text{g}/\text{m}^3$)
LTO/ F_{co} AND MAX nvPM _{mass}	116.0	1.04E+15	2301
AS % OF CAEP/10 LIMIT	-	-	38.3
AS % OF CAEP/11 LIMIT (InP)	5.7	8.0	
AS % OF CAEP/11 LIMIT (NT)	28.2	20.5	

MEASURED DATA

MODE	POWER SETTING (% F_{co})	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM _{mass} ($\mu\text{g}/\text{m}^3$)
				EI _{mass} (mg/kg)	EI _{num} (particles/kg)	
TAKE-OFF	100	0.7	1.293	70.8	4.02E+14	
CLIMB OUT	85	2.2	1.031	44.0	4.33E+14	
APPROACH	30	4.0	0.343	1.7	7.10E+13	
IDLE	7	26.0	0.110	0.7	2.66E+13	
LTO TOTAL (kg, mg, number of particles)			445	10104	9.12E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ F_{co} VALUES (mg/kN, particles/kN)				83.2	7.51E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ($\mu\text{g}/\text{m}^3$)				70.8	4.33E+14	1788

* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% F_{co})	CORRECTED EMISSIONS INDICES	
		EI _{mass_SL} (mg/kg)	EI _{num_SL} (particles/kg)
TAKE-OFF	100	82.1	1.01E+15
CLIMB OUT	85	53.2	1.30E+15
APPROACH	30	2.7	3.98E+14
IDLE	7	1.1	1.34E+14

AMBIENT CONDITIONS

	From		To	
	BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT(%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International
 TEST ORGANIZATION: Safran Aircraft Engines
 TEST LOCATION: Villaroche, France
 TEST DATES: 25/07/2019-30/07/2019

REMARKS

- Engine 849-166/1
- Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B